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THE FINANCE OF SCIENTIFIC & APPLIED RESEARCH[1]

1. *Introductory.*—It is now generally accepted that the provisions for scientific research in Britain were dangerously insufficient before the outbreak of the present war. Statistical material provided by the Parliamentary and Scientific Committee shows that the *per capita* appropriation in Great Britain, both for industrial and for public research, has been far below that in the United States of America and the U.S.S.R. It may be taken for granted that this neglect of new discovery is one of the reasons for the relative decline in British technical efficiency in the inter-war period. In view of the difficult position in which this country will find herself after the war, it is essential that measures be taken promptly to remedy the position so that the country should be able to hold its own in the general technical progress of other countries. General agreement seems to prevail also that the scope of technical and natural scientific research at the Universities and other public institutions should be drastically expanded by an increase of the Parliamentary Votes for the purpose. The further question arises how

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[1] We shall only consider research in the natural sciences, including medicine, and research aimed at applying new discoveries of a pure theoretical nature on a commercial scale. This does not mean that we consider research in the field of social sciences less urgent or less useful. Indeed, it may be argued that technical development has already far outstripped the development of social and economic organisation, with the result that new discoveries, instead of promoting real income, were a factor of unsettlement in the world, contributing to the drift to war.

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far the State should support without further regulation research carried on by private firms either directly by subsidies or tax remission, or indirectly by placing at the disposal of industry the facilities of, or results obtained by, public research institutions.

2. *The economic nature of technical research.* We must begin by considering the economic nature of scientific and technical research. From this point of view, expenditure on research should be equivalent to expenditure on plant.

Investment in plant is undertaken in the hope that the income stream created by selling the products will be sufficient to cover its cost, including the interest charge, and leave a surplus to the entrepreneur as a remuneration for bearing the risk of buying the plant and initiating production. Investment in technical research has less immediate motivation. The speculative hope of the entrepreneur financing it centres on devising a new method of production by which existing products might be cheapened, or creating a new product by which existing needs are better fulfilled, or which creates new needs profitable to supply. Its success, from an economic point of view, depends on whether in commercial application the new method or the new production yields a high enough return. From this follows :—

(*a*) That though research expenditure is on all fours with any other investment as far as its economic character and consequence are concerned, it differs from it in so far as it is far riskier. It necessitates, not merely current appraisal of commercial risks originating in the uncertainty about the future behaviour of given markets which is encountered in what one may call ' normal investment in plant,' but also of the scientific risk of whether new methods or products can be created, which risk is aggravated by the additional risk that scientifically ' valuable ' results may not yield commercially exploitable methods or products.

(*b*) Exploitable scientific discovery represents, on the one hand, an immediate potential increase in the real income; given available labour resources, it increases the profitability of current investment (*i.e.* the marginal efficiency of capital). On the other hand, it brings about the obsolescence of, thus complete or partial loss of capital invested in, older techniques or older products. The importance of new technical scientific discovery cannot be overrated especially for a country such as Britain, which can no longer rely for payment for essential imports necessary to maintain the standard of life on the income from accumulated past savings or by competing with countries with a poorer standard of life in producing standard articles by standard methods—methods which in the nature of technical development are increasingly easy to acquire. Its encouragement is a very important method of maintaining investment necessary to ensure full employment.

3. *The intention of the Law of Patents,* In due recognition of the double character of scientific technical research and discovery—its riskiness and its productivity—the State, even in the heyday of *laisser faire* anti-monopolism, granted exclusive monopoly rights of exploitation to the inventor for varying but substantial periods. Some, but in practice insufficient, safeguards were introduced to secure the com-

munity against the sterilisation of patents, but the rights to exclusive use were maintained (i.e. even the obligation to grant licences to others on payment of royalties commensurate to the initial expense and risks was not imposed). This attitude was not altogether unreasonable: discovery and invention were, to a large extent, a matter of genius and luck and not of organised and planned development. It was also thought that, after a lapse of time during which the inventor was to be remunerated by the monopoly profit, the patent would become free and thus the establishment of a settled monopoly position could be avoided. Nor must it be forgotten that, in the period when patent laws were first elaborated, it was taken for granted that the inventor himself would patent his product or method. Given the generally competitive character of industry of that period, there was no reason to suppose that the inventor would not license his patent but would himself try to maximise profits by establishing a monopoly market—i.e. by restricting output below optimum.

4. *The change in the economic and technical background.* Modern development has completely altered the technical and economic background. This alteration has not been explicitly recognised either by a reorganisation of scientific research in this country, nor indeed by the Laws concerning Patents. On the one hand, the cost of undertaking successful scientific research has vastly increased: indeed, it may be said that 'modern scientific work is largely a matter of team-work directed by first-class brains '[1] and its commercial application is a matter of further and increasingly lengthy, and therefore costly, experiments and technical research. Chance discoveries of momentous immediate importance, like those of the last century, though not unknown, have become the exception rather than the rule. The elaboration of new methods, new machines, new products, has become a conscious process, even if the genius of the initiating brain remains as important as ever. At the same time the unpredictable character of the risks connected with the finance of development research has changed and the risk has decreased with increasing systematisation and organisation. One may indeed claim that scientific discovery is the most momentous and important of those fields in which increasing returns to scale can confidently be expected. Consequently invention has become a process

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[1] Or in other words the ' investment ' is immediately ' written down ' by equivalent ' depreciation '. From the point of view of the Inland Revenue, expenditure on plant counts as capital expenditure, running costs including salaries as current cost. There is some flexibility in the Inland Revenue practice. In so far as the normal depreciation and obsolescence allowances are accepted in these cases the problem of ' unfairness,' as in the general problem of taxation of replacement reserves turns mainly on the general trend of prices and on whether profits are high enough to meet replacement expenditure at all (on which the actual grant of obsolescence allowances depend). We cannot discuss this problem in detail. To some extent this procedure is justified by the high risk attached to ' investment ' in ' ideas ' (*Cf.* below). The purchase price of commercially ' secured ' innovations—patents—is however treated as capital. The driving force behind the speculative backing of research is the capital gain arising from the capitalisation of future earning power of patents, the ' selling out ' by the ' ground floor ' speculator to the ' outside public.' In the case of the State, however, as we shall presently see, the risks are likely to be smaller than in the case of private firms.

rather than an act. This in its turn has changed the economic effects of patenting. Original master patents may become free but, such is the importance of cluster patents around them, representing greater and greater elaboration and development in technique, that important fields of production can no longer be expected to become free after the expiry of the first period. At the same time, the increasing costliness of research has restricted the scope of successful development research by small or even medium units. Only mammoth corporations can undertake extensive experimental work with the certainty of reaping a benefit eventually. Consequently the position envisaged by the original framers of patent laws, that inventors themselves would submit patents and grant licences freely, no longer arises. The large corporations—and, in the nature of things, the larger they are, the more efficiently they can attain this aim—will more and more themselves take out patents as a result of the research they themselves finance ; at the same time, the routine of research will enable them to stake out their claims in advance through blocking patents in many important fields in which new developments are expected. The cost of establishing claims to important patents, and even more the cost of defending them in litigation against wealthy corporations, is so considerable that the smaller firms or individuals has a decreasing chance to defend their rights and achieve their purpose.

5. *Research, patents and monopoly.* The centering in the hands of huge corporations of an increasing fraction of these innovations, coupled with the increasing power to defeat others, will have two-fold results: the first is that patents can be used for purposes of maintaining high prices by 'eliminating cut-throat competition' ; the second is that, as these big corporations extend the scope of their operations, they are more likely than not to oppose progress as they will become interested in an increasing volume of obsolete plant and will have less to fear from new competition. There will, therefore, be a tendency to sterilise inventions or new products in order to protect old investments.[1] Indeed, in some directions a somewhat constrictive influence was exercised on new research itself by the close relations maintained between monopolistic combines and the scientific departments of Institutes and Universities which have come to depend on them for the finance of many projects. Indeed, the extension of corporate aid to Universities may have an extremely *unfavourable* repercussion in so far as it will make for secrecy between researchers and between research institutions. The full development of scientific work would very much be hampered.

6. *International problems.* As long as research is conducted privately, the would-be owner and the present financier of the research will take care of the secrecy of the research. Some of the great combines take precautions which are reputedly similar to Secret Service methods : watchwords, codes, misleading messages and so on seem to be the order of the day. Now, it is apparent that such precautions waste a lot of energy and even more time. It is also quite obvious that a vast amount of the best brainpower will be wasted by unco-ordinated and competitive research, when it could either be used to speed up the solution of the

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[1] Parliamentary and Scientific Committee.

problem or used for other urgent purposes. The experience in war shows that the increased co-operativeness and the expansion of the State controlled work in which secrecy between research agencies is in principle eliminated speeds up the solution of scientific and technical problems. This has happened in spite of duplication, faulty liaison and all those drawbacks which characterise Government controlled research in a community in which the skeleton staff of the Government, which suddenly becomes of controlling importance, in peace has not the same standing as in war. During the war, however, the Official Secrets Act and Security Regulations isolate the national unit from unwelcome enquirers. A new dilemma arises, however, if a Government undertakes the finance of research on a great scale in peace time, and at the same time no measures are taken that a fair reward should accrue to the country initiating the work. If in one country research is not regulated or undertaken by the Government and thus internationally that country can use the results for exploitative purposes, the bargaining power of the country which forgoes this power of exploitation will be blunted and the terms of trade turned against it.[1] If, on the other hand, State research is to be made subject to patent, then the freedom of publication, of interchange of information, will be severely threatened, except in the purest type of activity.

Ideally the solution could be found in establishing international arbitration courts which would reward, not merely the actual inventor, but those pure scientists whose work was necessary for the actual invention, by bonuses to be drawn by international licence, of which part may be retained by the State or institution financing the research. Unfortunately, this ideal solution does not seem to be acceptable and, after the anti-monopoly campaign in America, considerations of this order have led the President's Enquiry Committee to recommend the integral maintenance of the present structure of the Patent Law in America. Under these conditions, and pending a better arrangement, the results of public research should be patented in the name of the institution or University under whose auspices they were developed and their foreign use should be subject to royalties on the same commercial basis at which the results of other countries' research (including that undertaken by commercial firms) is made available to that country.

7. *Tentative conclusions and suggestions.* We may now draw some tentative conclusions as far as the internal regulation of the research activity is concerned.

(*a*) *Stimulus and control of research.* A stimulus to research is equivalent to a stimulus to investment. Subsidies to private investment in plant of existing types, without adequate safeguards that it will not lead to the creation of mere excess capacity but will in fact resultin a modernisation of the capital equipment of the country, can hardly be recommended because of their abortive character.[2] Stimulus to research, public and private, into new methods or products cannot be ruled out on this score, as it creates, in all cases, new and more efficient methods and thus leads to a potential increase in the national real income, on the one hand, and in the international competitive capacity of the country on the other.

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[1] To some extent this procedure is justified, *Cf.* below.

[2] *Cf.* the forthcoming contribution of Mr. M. Kalecki in ' Oxford Economic Papers.'

The problem in this connection is therefore not that the investment, if successful, will prove abortive in a social sense, but that the effectiveness of the new discovery will be either sterilised or used for purpose of undue monopoly gains. While, therefore, the stimulus to research can only be welcomed on economic grounds, measures must be taken to safeguard the interests of the community in preventing exploitation and a retardation of progress.

(*b*) *Publicly financed research.* It seems quite apparent that the main burden of increased research must, as matters stand at any rate in Britain, be borne by the State. In many industries adequate facilities cannot be maintained by existing firms and even co-operative research financed by industries as a whole may be, and in many instances will be, restricted by financial reasons to a wholly insufficient scale. With increased outlay, of which even prosperous industries may be incapable, the likelihood of obtaining satisfactory results very much increases. It is also to be remarked that centralised expansion, by permitting a pooling of certain overhead costs (such as apparatus, certain kinds of repair shop) *decreases* the cost of research of a given efficiency. In the main, therefore, the expansion of research should be undertaken by Universities or other public institutions. It would be necessary therefore to establish technical Universities, on the lines of Continental 'Polytechnica' or 'Technische Hochschule' to concentrate on the application of pure research to industry and more especially to develop the methods of increasing individual efficiency of workpeople by appropriate arrangements of work benches, movements, etc. The stimulus of pure research, and its adequate remuneration, would equally be essential as, in the longer run, technical efficiency depends on a satisfactory body of pure investigations.. The results of research should be made available on a licence basis to industry.[1] The condition of use should include a control of the profit margin on the articles produced by its use.[2]

(*c*) *Stimulus to privately financed research.* Private research should be encouraged by tax exemption on expenditure even of a capital character, not by direct subsidy, provided the firms are ready to undertake to submit to official control of their price and profit margin, as well as their production policy, including the utilisation of the results of research. In determining under what conditions the results may be withheld, or rather planned over a period, the State must take into account the social cost of shifts.[3] If a firm claims tax exemption on *any* of its research, the *whole* of its research must come under State supervision, for otherwise the possibility of evasion would be uncontrollable. The growing experience and growing scope of University finance, etc. will yield suitable control material to determine reasonable profit margins, royalties, etc. on new discovery, on the basis of the expense incurred, combined with the risk run. In case of refusal to submit to public supervision *all* development expenditure, *i.e.* even the now exempt 'current' running expenditure should be made subject to taxation.

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[1] The problem of compulsory licensing must also be solved. A general rule in this connection cannot be made, but the agreement between the Inland Revenue and the industries should contain an option.

[2] Whether or not the licence fee should in the longer run cover the budgetary appropriations for research will depend on whether the State wishes to 'recoup' itself by indirect taxes on the products whose production was facilitated by the grants or by general taxes or finally is content to finance it by borrowing (*Cf.* above). Foreign firms should be treated on a basis of reciprocity.

[3] In granting licences due consideration must be given to the secondary repercussions of the new development especially on the location of industry.

We may sum up by saying that stimulus to public and private research in conditions which exclude a misdirection and misuse of the results should be one of the main tasks of reconstruction.

T. BALOGH.

THE PEAK OF THE WAR EFFORT IN THE UNITED STATES ?

For some time there have been indications of a considerable slowing down in the pace of expansion of American war production. Industrial employment (the 'number of employees in non-agricultural establishments') has been more or less stable since the end of 1942. Weekly hours worked have increased only slightly (from 44.2 in January 1943 to 45.1 in August). War expenditures have fluctuated round approximately the same level since April 1943 (corresponding to an annual rate of about $87 billions).

These indications, it is true, conceal certain shifts : 'Mobilisation of manpower' as a whole has still increased, because the armed forces expanded (from 7 million in January 1943 to over 10 million in December) ; but the greater part of the expansion took place in the first half of the year. With constant industrial employment there was a shift from non-essential industries, again mainly in the first part of the year. And with (roughly) stationary war expenditures since April, there was a shift from war construction to munitions production proper. Thus the production of munitions is still rising.

What is the probable trend in the near future ? The plans for war production were revised downwards some months ago : the estimates of war expenditure for 1943-44 have been cut down. Similarly, the estimate of manpower to be employed in munitions in 1944 has been reduced from 11.6 millions to 10.7 millions.[1] As the number of employed in munitions industry in July 1943 was 9.6 million, and as a considerable decrease in employment in war construction (of the order of a million) is planned for, it appears that munitions employment is to increase roughly by the amount of labour set free in war construction. Thus the overall war effort in terms of manpower should remain more or less stationary.[2]

What are the reasons for this development ? It does not seem that limits have been reached beyond which it is impossible to expand war output. A fair comment on this question is offered by a report of the National Management-Labour Policy Committee, released by the Manpower Commission, which states that ' vast unused manpower resources of longer hours of work, improved performance of workers and employable women are still available.' [1] It may be added that the scarcity of general labour is acute in parts of the country only, and potential resources in other parts remain untouched. Apart from this, the fact that consumption (in real terms) has never ceased to rise does not indicate a very great strain on the civilian economy.

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[1] *Daily Telegraph*, Dec. 3, 1943.

[2] Assuming that war employment in government agencies and transport does not rise significantly.

If the peak has indeed been reached the explanation must be sought elsewhere. It is not easy to find it, since (*a*) the target for the armed forces is still 11 million men, and (*b*) a second front in Europe with prominent American participation has been announced.[2]. Some factors of economic policy, however, may be indicated, which contribute part of the explanation.

It appears that the price stabilisation policy may not continue for very long. Since Congress voted with an overwhelming majority against subsidies, their use may be banned very soon, and the Administration will then be unable to prevent a rise in prices. In face of this uncertainty the trade unions have decided that it is no use any longer to wait for the promised ' roll-back ' of prices. Following the example of the coal miners who forced the Administration to go back on the ' Little Steel formula,'[3] the steel workers and railway workers have put forward their claims for wage increases. There is little doubt that wage stabilisation will not continue in face of this pressure, except at the cost of a complete dislocation of production. As in the case of subsidies, other anti-inflation measures are also frustrated : the administration's new tax proposals have been cut down from $10 to $2 billions. The rationing technique has not been perfected ; instead, the policy for this winter has been to increase the allocations for civilian consumption of meat and butter.[4] This may justly be described as a step towards de-rationing (which in the case of coffee has already been carried through).

The conclusion emerging from this picture is that the Administration, deprived of the means of a genuine anti-inflation policy, and nevertheless interested in preventing any but a slight inflation, is resorting to a very simple anti-inflationary measure, namely to cut war expenditure, and to increase civilian supplies.

A similar conflict can be seen in the field of labour policy. The scarcity of labour in lumbering, metal mining, chemical industry, in railways, and docks, and finally in the whole aircraft industry on the Pacific coast has led to a drop in output in many cases and accumulation of goods in docks. A report by Mr. B. Baruch, issued in September, proposed that ' labour budgets ' should be drawn up regionally, and the available labour should be allocated to employers. The distribution of contracts as between different regions should be adjusted to the available labour reserves. The report also recommends that deferment from call-up should be based on occupation only (and not on family responsibilities). The report has not been acted upon, and is not likely to be.[1] The general reason for the opposition against such ' bureaucratic ' measures as allocation of labour, rationing, subsidies, etc., is that they may serve as a *precedent* for similar measures to be taken in peace-time for the purpose of securing a balanced and stable economy with high employment.

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[1] *Financial and Commercial Chronicle*, Nov. 11, 1943, p. 1921.

[2] A recent report shows that considerable shifts in munitions production have taken place during 1943. Production of tanks, anti-aircraft guns and small arms has been reduced considerably, while the production of planes is further increasing. This shift partly explains the shut-down of munition plants. As it indicates a serious reduction in the production of army equipment, it is difficult to square it with the two facts above mentioned, the retention of a large army, and intended major land operations.

[3] This formula limits wages increases to 15% above the level of January 1941, whereas the cost of living is 23% above its level at that date.

[4] *Economist*, December 11, 1943.

In the absence of any unforeseen military events the war economy in the U.S. is therefore likely to develop differently from that in Britain : it will stop short of a level of ' mobilisation ' which can only be attained by means of rationing and far-reaching controls ; a price rise may ensue, but vigorous inflation will probably be prevented by a cut in expenditure. If the same medicine were applied to the specific problem of food scarcity,[2] this would inevitably mean a diversion of food from lease-lend civilian consumption.

J. STEINDL.

INFLATION IN INDIA

The present economic crisis in India was not unforeseen either by external observers[3] or by the Indian Government. But solutions developed with varying degrees of success in other countries, e.g. the British policy of price-stabilisation by control and subsidy combined with rationing, appeared to be for India inapplicable *in toto*, chiefly because of the lack of an administrative staff. Lacking a guiding principle, partial remedies have been tried from time to time, but that the policy has not been entirely successful can be seen from the changes in prices reflected in the All-India index[4] given in Table I.

The chief causes of the rise in prices have already been summed up in a previous article.[5] Following the same general procedure these factors will be analysed here in more detail.

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[1] Since the above was written the President has proposed, in his message to Congress, a National Service Law coupled with a continued policy of price stabilisation, subsidies, and increased taxation. The National Service Law which is mainly directed against strikes is a concession to those groups who might oppose the rest of the proposed legislation.

[2] The increased allocations of meat for civilian consumption this winter are connected with a scarcity of feeding stuffs which made increased slaughter necessary. The same reasons make a decrease in meat supplies in 1944 likely.

[3] *Cf.* J. Steindl : Impact of the War on India. BULLETIN Vol. 4, No. 5.

[4] The situation in Calcutta is still worse, *cf. Calcutta Index of Wholesale Prices* 1939-1943.

	Aug. 1939	*Aug.* 1942	*Aug.* 1943
All Commodities ..	100	192	345
Cereals	83	205	690
Other Foods ..	114	310	509

[5] *Cf.* J. Steindl, loc. cit.

TABLE I

Index Numbers of Wholesale Prices by Groups of Commodities

(Source : Economic Adviser to the Government of India)[1]
19th August 1939—100

	Aug. 1940	*Aug.* 1941	*Aug.* 1942	*Mar.* 1943
General Index	108.4	142.5	161.1	220.1
1. Food and Tobacco	103.2	128.6	160,2	271.0
2. Other Agricultural Commodities	98.2	152.7	141.6	212.3
3. Raw Materials	118.9	147.2	161.8	172.0
4. Sugar	89	97*	120*	143†
5. Kerosene	124	136	177	194
6. Cotton manufactures ..	110	192*	262*	442*
7. Galvanised corrugated iron sheets	132	221	238	309

* Estimates only : market quotations not available.

† Rise due to Gur—raw sugar of cheap quality. White sugar price controlled since April 1942.

THE RISE IN DEMAND

Since January 1942, prices of all commodities have increased steadily, the rise being more rapid in consumer goods than in industrial raw materials such as cotton and jute. (The one exception is tea which is now purchased in bulk by the Central Government, for distribution amongst the United Nations.) This is a reflection of the fact that purchasing power is being generated by an even bigger foreign balance[2] and budget deficit than anticipated. Revising the estimates for 1941/42 and 1942/43 given by Dr. Steindl his table becomes as follows.

TABLE II

The Foreign Balance and Budget Deficit[3]

(Crores[4] of rupees)	1939-40	1940-41	1941-42	1942-43	1943-44
Foreign balance	45	60	227	420	—
Budget deficit (+) or surplus (—)	—8	+8	+13	+144	+57*
	40	70	240	560	

* 1st estimate.

The rapid rise of the foreign balance is only partly due to the changes in the balance of private trade in merchandise and treasure (Table III). The more important factor is the increasing volume of war items directly financed in sterling by this country. The effect upon Indian industries can be gauged from the increase of Government contracts from 78.7 crores of rupees in 1940-41 to 184 crores in 1941-42 and to 256.6 crores in 1942-43. The total since September 1939 has been 548 crores (of which 5 crores in 1941-42 and 10 crores in 1942-43 were the amounts of contracts placed with small-scale industry). At the same time recruitment per month to the armed forces has increased from 60,000 at the end of 1942 to 72,000 later. The number of men in the Army alone is now over 2,000,000, whereas before 1939 the Indian Army numbered 187,000 of which about 150,000 were Indians.

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[1] Adapted from reprint in Report on Currency and Finance, 1942-3. Reserve Bank of India.

[2] Excess of in-payments over out-payments.

[3] Source : Report on Currency and Finance, Reserve Bank of India, 1942-43.

[4] 1 crore of rupees=£750,000 (at 1s. 6d. =Rs.1.)

Table III. *The Balance of Private Trade* 1938—1943[1]

(Crores of rupees)	1937-8	1938-9	1939-40	1940-41	1941-42	1942-43
1. Balance of private merchandise trade (India + Burma)	+43	+43	+77	+69	+115*	—
2 Balance of private merchandise trade (India only)		+17	+66	+42	+80	+84
3. Balance of private treasure export (:India+Burma;)	+15	+23	+41	†	†	‡

*Burma up to December 1941. †Figures not available but probably decreasing.

‡ No gold exported in 1942-43 since Indian prices greater than export parity throughout the year.

Wage statistics are not available but no matter how small the rise[2] in wage-rates, the wage-bill (including soldiers' pay) must now be considerably inflated. Agricultural incomes per head have increased both in real and in money terms, the first because of the continuous removal of the surplus agricultural population[3] and the second because of the increase of agricultural prices, though the peasant himself does not get the whole benefit of this. There is also the money sent back to their homes by the recruits to other occupations.

The magnitude of the resulting increase of demand can only be estimated. Neglecting, as a first approximation in India under war conditions, the construction of industrial equipment and accumulation of stocks, the sum of the foreign balance plus the Budget Deficit represents 'investment' in the sense of Lord Keynes' General Theory This has increased from 40 crores to 560 crores of rupees in a country whose National Income was estimated to be about 2,500 crores of rupees in 1942.[4] Investment in such proportions presents 'a considerable financial problem for India' (cf. J. S. Steindl *loc. cit.*). This could be eased by increased direct[5] taxation to reduce the Deficit, and price-control in war contracts to reduce the foreign balance. The latter is already being reduced by the shrinkage of grain exports and the prohibition of textile exports, coupled with some increase in imports of grain (*cf.* Table III lines 2 and 3 for 1941-42 and 1942-43).

But the problem is not only a financial one. Since consumers' goods are likely to constitute a higher proportion of exports from than of imports to India. Table IV, below, reflects a considerable deteriaortion of the civilian supply position.

Imports of cotton piece-goods, for example, fell from 618 million yards in 1937-38 to 50 million yards in 1942-43, while exports of these increased from 240 to 1,000 million yards and Indian mill production from 4,080 to 6,400 million yards. Total supplies available for consumption in India rose from 4,458 in 1937-38 to 5,450 million yards by 1942-43;

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[1] Source: *Reserve Bank of India Report on Currency and Finance* 1942-43.

[2] This has been proportional to the cost of living index in some industries; C. of L. Index, Bombay, March 1942=225.

[3] Since total output does not fall, output per head increases.

[4] Quoted by the *Economist* Dec. 17, 1943. The National Income of India *plus* Burma was estimated at 1600 to 1800 crores in 1931-32.

[5] Indirect taxation can be described as 'controlled inflation.' In 1942-43, income-tax on corporations and individuals yielded 66% of total tax revenue or 78 crores. Since E.P.T. is still only 66⅔%, supertax only 12½% on incomes over £1,875, and corporation tax only 12½% for the 1943-44 Budget, increases are still possible.

TABLE IV

Index Numbers of Volumes and Prices of Imports and Exports:

India 1939-43* (1938-39 = 100)

		1939-40	1940-41	1941-42	1942-43
Imports					
	Volume	102.0	81.3	74.2	37.6
	Price	106.4	126.7	153.4	192.9
Exports					
	Volume	104.5	88.1	93.4	62.5
	Price	119.8	130.3	155.9	184.6

* Source: Reserve Bank of India, *Report on Currency and Finance* 1942-43.

nevertheless, as Table I shows, the retail position was already difficult in August 1941 though improvement may follow the recent prohibition of further export. It is not clear whether the whole increase in home stocks became available for civilian consumption. In these circumstances, a sectional inflation in food, the chief consumption good still available, is only to be expected. The obvious remedies are already being applied by the Indian Government: supplies of other consumption goods, especially cloth, are being made available for sale. (The quantities cannot be large, since they appear to be from Indian home production). Further, gold is being imported for the same purpose. But there is reason to believe that 'hoarding' is not the cause of the present scarcity, for actual surpluses are likely to be smaller than in times of less agricultural prosperity.

As the White Paper points out, 'With not enough to eat (the Indian peasant) often had to underfeed himself to meet his financial liabilities (the money-lender and tax-collector).' The first result of the increase of agricultural prices is therefore that the peasants can retain increasing fractions of output for their own personal consumption, sales of smaller factions sufficing for their money requirements.[1] Even by 1935, it was estimated that the available food supply (plus imports minus exports) fell short of minimum food requirements by the amounts required to sustain 48 million 'average' men (on the basis of 2800 calories per day in Indian conditions as compared with the Royal Society's estimate (1914-18) of 3390 calories for an average man in Western countries).[2]

THE FOOD SITUATION.

1. *Supplies*: At the same time, grain supplies at home are highly inelastic: the area under the principal food-grains has been more or less constant since 1919, while the slight improvements of agricultural methods have been largely offset by the gradual reduction of the area suitable to double-cropping.

The available supplies of the principal food grains have been officially estimated on the basis of production figures.[3]

It can be seen that the net grain position for All-India is no worse than usual, in fact is just above the average for the preceding six years. Of this quantity Army purchases are fixed at 650,000 tons and, as the Report of the Food Grains Committee emphasises, 'Indian troops would also consume food grains if they had remained civilians,' though they may now consume more per head.

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[1] From the financial point of view this means that the money National Income is increasing both as a result of increasing Investment and a rising Income Multiplier.

[2] Mukerjee: Food Planning for 400 Millions, p. 10.

[3] Production statistics are notoriously defective: these figures are probably low, yet the error is likely to be constant.

TABLE V*

Net amounts of Principal Food grains available for All-India consumption (000 *tons*)
(*i.e.* Production plus net imports or minus net exports)

Fiscal year	Aggregate yield (crop year)	Total Exports (—)	Total Imports (+)	Rice & Paddy	Wheat etc.	Other Grains	Total Net Imports(+) or Exports(—)	Total available for for consumption
1937-38	54,324	—967	+1,596	+1,165	—505	—30	+ 629	54,953
1938-39	49,584	—828	+1,872	+1,253	—195	—14	+1,044	50,826
1939-40	53,061	—493	+2,714	+2,139	+ 19	+63	+2,221	55,282
1940-41	50,173	—556	+1,549	+1,097	—121	+17	+ 993	51,166
1941-42	51,817	—771	+1,202	+ 723	—260	—32	+ 431	52,248
1942-43	53,928	—379	+ 18	— 259	— 26	—76	— 361	53,567

* Source : Cmd. 6479. India (Food Situation 1943).

The Committee urged the necessity for an increase in supplies by import, by increasing home production, and by increasing the inducement to part with individual surpluses. Further, it recommended the distribution of at least 1℔ a day of cereals[1] by rationing of all towns with a population of 100,000, this to be coupled with price-control of all major food grains. Its recommendations as regards price-control and rationing have been adopted by the All-India Food Conference but it is clear that distribution is regarded as more urgent than the question of increasing supplies. Even the continued export of food grains is apparently envisaged.[2] The Government's Food Plan is indeed based upon the following formula for calculating the required supplies.

> ' Normal consumption requirements should be taken as the average of the estimated harvests of all food grains over a five-year period ending 31st March 1942, plus the imports and minus the exports of the same period. Surpluses and deficits should be calculated on the basis of normal consumption thus determined and compared with the estimates of the forthcoming year's or half-year's production of all foodgrains.'

It is difficult to reconcile this method of estimating grain requirements with the accepted recommendation of a ration of 1℔ of grain per head of population. The Food Member in his speech on August 9th in New Delhi gives 388 millions as the population of India in 1941, on which basis grain requirements total 63 million[3] tons. If *half* the population consume a little more, e.g. 1¼ ℔ a day, grain requirements go up to 72 million tons. However, the figures quoted in Table V refer only to the principal foodgrains. A most exhaustive estimate of available food supplies has recently been made (Mukerjee : Food Planning for Four Hundred Millions, 1938), which gives a yearly average yield of all foodgrains of about 80 million tons. Allowing for seed (12—13 million tons), for export (about 2 million tons) and for wastage (about 10 per cent), he arrives at an annual average of about 60 million tons net foodgrains supply available for consumption. Even if we reduce seed requirements to the figure of 4.5 million tons estimated by the Food Member, rule out exports and reduce wastage allowances by half, the net supply is likely to be only just over 70 million tons. This leaves a surplus (7 million tons) if consumption remains at 1 ℔ per head per day, but it threatens to become a deficit should *per capita* consumption increase, as is to be expected by reason of rising money incomes alone.

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[1] 1 ℔ of wheat=1632 calories
1 ℔ of rice= 1584 ,,
(McCarrison)
Ration of cereals cannot be lower because 'there is no great chance of the mass of the urban population being able to supplement the ration by intake of other foodstuffs on any significant scale.' Cmd. 6479, p. 24.

[2] 'Procurement for domestic requirements and for export must continue. . . . (p. 27, Cmd. 6479).

[3] The Hon. Member gives 50.5 million tons at 1 ℔/day and 61 million tons at 1¼℔ day as his estimate on this basis, but the corresponding population figure is only 310 million.

Adapting Table IV, p. 33, Cmd. 6479, we get the following supplies of the normal[1] foodgrains per head in each of the Provinces.

TABLE VI. *Per Capita Supplies of Normal Foodgrains per day (Production + imports — exports)*

			Exporting Provinces			
Province	**Punjab**	**Cent.Prov.**	**Sind**	**Orissa**	**United Prov.**	
℔ per head	.86	1.08	1.09	.78	.75	
			Importing Provinces			
Province	**Madras**	**Bombay**	**Bengal**	**Bihar**	**N.W.F.P.**	**Assam**
℔ per head	.85	1.46	.74	.59	.67	.96

It can be seen that, even allowing for undeclared peasant stocks none of the Provinces has a great surplus per head even if consumption remains at 1 ℔ per head per day. While, in Bombay Presidency, normal supplies per head are 1.26 ℔ per day, even excluding imports from other areas. Since Bombay is one of the richer provinces, having both a large industrial population and a low rural density compared with the others, this suggests that the consumption of at least 1¼ ℔ of cereals is to be expected in times of prosperity, even when other food is available.

India's most urgent problem is that of increasing agricultural supplies. Imports of grain are being made to deal only with the present emergency but it is probable that they may have to continue if a second breakdown is to be avoided. A 'Grow More Food' campaign was started last year and a 5% increase of acreage is reported. But much reliance cannot be placed on a mere extension of area, since this is likely to be most difficult where the food shortage is most acute, that is, in the most densely peopled regions (e.g. in the Ganges valley the proportions of cultivated to cultivable area ranged from 75% to 95% in 1935).[2] In many areas there is said to be already an over-extension of agriculture, which has resulted in the worst consequences of deforestation, e.g. rapid fall of the subsoil water and soil erosion. And even in surplus provinces the limits of canal and well-irrigation have almost been reached. Yet yields per acre in India, China and Japan are respectively 8.1, 9.7 and 13.5 quintals of wheat and 16.5, 25.6 and 30.7 quintals of rice.

It is for reasons such as these that the Gregory Committee favours intensification of agricultural technique to be based in the first instance upon imports of fertiliser and agricultural machinery until Indian industry is enabled to make the commodities itself by imports of the necessary capital equipment. The new techniques cannot easily be widely applied by the uninstructed peasantry, especially with the present fragmentation of holdings.[3] Governmental assistance and direction will be necessary to bring about, for example, mechanical ploughing and the correct use of fertilisers on the large scale. This

[1] *i.e.* Rice, Wheat, Millet and Grain.

[2] Mukerjee: Food Planning for 400 Millions, p. 10. [3] Often ¼ acre in Bengal.

might be organised[1] as a public service throughout the country for the duration of the emergency at least.

2. *Distribution.* Even the success of attempts at controlling distribution depends upon the availability of supplies large enough to guarantee the ration fixed. Food imports for some months at least are needed. Once an adequate food-grain reserve is known to exist, the extent to which supplies become available for non-agricultural consumption is determined by the system of controls. Rationing at subsidised prices of urban centres numbering more than 100,000 inhabitants has been officially accepted[2] but its success in achieving more equal distribution depends upon two other factors: the methods of controlling retail distribution of rations and the control achieved over the rural areas. For the first, the experience of countries in the Middle East suggests that Government-operated retail stores are the best weapon; but the most that can be expected from even the successful rationing of towns is the provision of a minimum diet, while it is apparent that it is being expected to 'secure effective limitation of demand.' (Cmd. 6479 p. 27). This depends, however, upon the second factor, for 90% of India's population still lives in rural areas.

CONTROL OF AGRICULTURAL SUPPLIES

Effectively to limit rural demand, rigid requisitioning of grain stocks would be necessary; and this the Central Government is loath to do because, for one thing, the administrative difficulties would be immense. Without such requisitioning, the peasant surpluses are likely to go to the highest bidder, and since the Government is also anxious to secure its purchases at controlled prices,[3] the probable channel will be the black market.

The present policy rejects a Central Grain Monopoly: the Provinces are each to set up their own buying agencies which are to eliminate competitive purchasing (with the assistance of the Central Transport Control) and to buy in surpluses at a 'fair' price from the peasant. The incentive to 'dishoarding' of grain is to be provided by making gold freely available on the market. The weakest point of this scheme is in the attempt to control prices to the peasants in the face of the existing incentives to black market activities. Not only is the ration recommended in the urban centres low, but it is admitted that rations will also have to be distributed even under normal circumstances to several rural areas (e.g. in Bengal and the United Provinces). Suppression of the black market will depend to a great extent upon the police constable. If the extent to which demand exceeds supply has not been exaggerated, the continued incentive to smuggling is likely to prevent the procurement of surpluses at which the scheme is aimed. For the profiteer will be able to buy his black market stocks cheaply by paying just a little above the controlled price, while it will pay the cultivator to sell his surplus to the speculator and therefore to be in a position to buy more gold than he could get by selling to the Government agency at the 'fair' price. Peasants' and profiteers' savings in gold may then increase, their consumption of grain remaining constant at the new high level or perhaps even rising still (to say nothing of the quantities hoarded for security reasons).

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[1] Trainees for agricultural services could be turned out through Government schools in the same way as for industry at present.

[2] This has begun to operate already in Calcutta, Bombay and the Punjab.

[3] Surpluses will be smaller because of the lack of incentive to reduce consumption.

The limitation of official prices to the producer helps chiefly to increase the profit margins of the speculators. One way out would be to pay high prices to producers while retailing sufficiently large rations to consumers at subsidised prices. But supplies for rations large enough are not available. Black market profit margins could be reduced considerably if the official prices paid to producers were permitted to rise. Yet the resulting increase of peasant incomes would lead to the further spread of inflation. The monetary mechanism for the allocation of resources would seem to have broken down completely.

The only alternative is to develop a system of direct barter, paying for grain either with rations of other consumption goods (textiles, kerosene oil and corrugated iron sheets are the chief items) or if these cannot be obtained in sufficient quantity, then with gold or both. In either case price policy might then be adjusted to bring about either some real reduction of peasant consumption or some increase of his output or both. Barter purchasing could be done in bulk at stated periods of the year and directly from the cultivator. The price *per unit* for small quantities of grain could be smaller than the price *per unit* of larger quantities of grain. The peasant would then have a real choice between saving and consuming, for a high level of money (or gold) savings would only result from a high level of real savings (or from an increase of real income in grain) i.e. from the contribution to the common pool of a large grain surplus.

It is obvious that a considerable degree of organisation would be required and that evasion would remain a problem for some time. The required uniformity would best be achieved by setting up a Central Food Grains Monopoly which could co-ordinate barter-price policy with the supply of gold or consumers' goods and with the necessary transport arrangements. But the Central Food Grains Monopoly has been rejected already ' not on the grounds that it is inherently unworkable—on the contrary, it is the only perfectly logical solution of the difficulties—but on the ground that India finds herself in the middle of a crisis, and the creation of the vast organisation which would be involved would take time ; and time is not available.' (Cmd. 6479, p. 23.)

Against this view two arguments must be urged : one, that the organisation necessary to affect the situation will be no less ' vast ' if built up separately, piece-meal, in each province ; it may well be even larger and yet less well-co-ordinated. The second that it is apparent that India's food crisis is not likely to be short-lived either in Bengal or in India as a whole. Any further local catastrophe may lead to a famine, as in Bengal, unless imports are readily available on a considerable scale. If this strain upon Allied shipping is to be reduced, grain output must be increased and the surpluses be made available for consumption. In view of the breakdown in the monetary mechanism, this would seem to be capable of achievement only by more direct interference from the Government—by Governmental direction and control of farming and a system of barter to secure supplies, these being distributed to the non-agricultural population by rationing at controlled prices.